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RELEVANT PLANT TRAITS FOR HIGH YIELDING RICE IN THE TROPICS ARE DIFFERENT DEPENDING ON THE MATURITY GROUP AND THE CROPPING SEASON

T. Lafarge[1], *C.S. Bueno*[2]
[1]*BIOS, CIRAD, Montpellier, France*
[2]*CESD, IRRI, Los Banos, Philippines*

Purpose:
Irrigated rice breeding programs in the tropics are generally not selecting for different genotypes with respect to the cropping season. However, differences in incoming radiation between seasons question if breeding objectives with respect to plant traits should be distinct for each cropping season.

Approach and methods used: Thirty-two high yielding and highly contrasted genotypes (20 hybrids and 12 elite inbreds from the Philippines, India, China and Colombia) were grown under the dry and wet seasons in the lowland IRRI experimental fields in the Philippines. In the course of the analysis, first, these genotypes were grouped with respect to crop duration to remove any bias due to the effect of duration on the growth dynamics. Second, yield formation processes were analyzed via two main components, the potential sink size (virtual grain yield assuming all the spikelets get fully filled) integrating the pre-flowering phase, and the filling efficiency (ratio of filled over total grain number) integrating the post-flowering phase.

Key results: No correlation was reported in both seasons between grain yield and biomass at flowering, however, for each maturity group, grain yield was significantly correlated with potential sink size, and with filling efficiency within subgroups of genotypes with similar potential sink size. In the dry season, traits favoring light capture throughout the crop cycle were highlighted, associated with high specific leaf area as early trait and high specific stem length as late trait. In the wet season, reduced plant height and traits accounting for delayed leaf senescence were correlated with higher yield. Also, traits favoring early light capture were desirable for the early maturity group but detrimental for the medium and late maturity groups. In addition, hybrid rice was reported as lower yielder than elite varieties when moving from the dry to the wet season and from early to medium and late maturity groups.

Synthesis and Applications: These results claim for considering contrasted target traits with respect to the cropping season and the maturity group when selecting for high yield in the tropics. This should have strong implications on the on-going breeding programs and lead to the development of contrasted plant types with respect to the expected climate conditions.